What is claimed is:

1. An impedance matching feed for matching an impedance for a coaxial transmission line to an impedance for a ridge waveguide, said impedance matching feed comprising:

(a) a transformer having a conductor, a dielectric surrounding said conductor and a length, the dielectric of said transformer having a constant outer diameter along the length of said transformer, said transformer being positioned within a ridge of said ridge waveguide, said transformer having one end connected to said coaxial transmission line;

(b) a probe disposed within an interior of said ridge waveguide, said probe having one end connected to the conductor of said transformer and another end connected to an upper wall of said ridge waveguide; and

(c) the conductor of said transformer being shaped to match the impedance for said coaxial transmission line to the impedance of said ridge waveguide at a reference plane which is formed at a location where said coaxial transmission line is connected to said ridge waveguide, when the impedance of said coaxial transmission line and the impedance of said ridge waveguide differ from one another.

2. The impedance matching feed of claim 1 wherein the conductor of said transformer is shaped to match a fifty ohm impedance for said coaxial transmission line.

3. The impedance matching feed of claim 1 wherein said transformer is centrally located in the ridge of said ridge waveguide and said probe is centrally located within the interior of said waveguide.

4. The impedance matching feed of claim 10 wherein said ridge waveguide is terminated by a quarter wave choke.

5. The impedance matching feed of claim 1 wherein the conductor of said transformer is a tapered conductor.

6. The impedance matching feed of claim 1 wherein the conductor of said transformer is stepped conductor having a plurality of steps with each of said plurality of steps having a different diameter and each of said plurality of steps having an equal length.

7. The impedance matching feed of claim 1 wherein the conductor of said transformer is stepped conductor having a plurality of steps with each of said plurality of steps having a different diameter and each of said plurality of steps having a different length.

8. The impedance matching feed of claim 1 wherein said probe couples radio frequency electrical signals between said ridge waveguide and said coaxial transmission line.

9. The impedance matching feed of claim 1 wherein the conductor of said transformer is fabricated from an electrically conductive material, and the dielectric of said transformer is a fabricated from a dielectric material.

10. The impedance matching transformer of claim 1 wherein said transformer has an outer conductor, the outer conductor of said transformer being shaped to match the impedance for said coaxial transmission line to the impedance of said ridge waveguide at said reference plane when the impedance of said coaxial transmission line and the impedance of said ridge waveguide differ from one another.

11. An impedance matching feed for matching an impedance for a coaxial transmission line to an impedance for a ridge waveguide, said impedance feed comprising:

(a) a transformer having a conductor, a dielectric surrounding said conductor and a length L_2, the conductor of said transformer having a diameter configured to provide an impedance match with said coaxial transmission line and the dielectric of said transformer having a constant diameter along the length L_2 of said transformer, said transformer having one end connected to said coaxial transmission line, said transformer being positioned within a ridge of said ridge waveguide;

(b) a probe disposed within an interior of said ridge waveguide, said probe having one end connected to the conductor of said transformer and another end connected to an upper wall of said ridge waveguide; and

(c) said transformer having an impedance $Z_t(L_2)$ which is calculated in accordance with the equation:

$$Z_t(L_2) = \sqrt{Z_g(Z_{coax})}$$

where: Z_g is a waveguide impedance for said ridge waveguide; and Z_{coax} is a coaxial transmission line impedance for said coaxial cable.

12. The impedance matching feed of claim 11 wherein said probe couples radio frequency electrical signals between said ridge waveguide and said coaxial transmission line.

13. The impedance matching feed of claim 11 wherein said probe is fabricated from an electrically conductive material.

14. The impedance matching feed of claim 11 wherein the conductor of said transformer is fabricated from an electrically conductive material, and the dielectric of said transformer is fabricated from a dielectric material.

15. The impedance matching feed of claim 11 wherein said transformer is a single step quarter wave transformer.

16. The impedance matching feed of claim 11 wherein said ridge waveguide is terminated by a quarter wave choke.

17. An impedance matching feed for matching an impedance for a coaxial transmission line to an impedance for a ridge waveguide, said impedance matching feed comprising:

(a) a transformer having a conductor, a dielectric

surrounding said conductor and a length L_2, the conductor of said transformer having a diameter configured to provide an impedance match with said coaxial transmission line and the dielectric of said transformer having a constant diameter along the length L_2 of said transformer, said transformer having one end connected to the transmission line of said coaxial cable, said transformer being centrally located within a ridge of said ridge waveguide;

(b) a probe disposed within an interior of said ridge waveguide, said probe having one end connected to the conductor of said transformer and another end connected to an upper wall of said ridge waveguide, wherein said probe couples radio frequency electrical signals between said ridge waveguide and the transmission line of said coaxial cable; and

(c) said transformer having an impedance $Z_t(L_2)$ which is calculated in accordance with the equation:

$$Z_t(L_2) = \sqrt{Z_g(Z_{coax})}$$

where: Z_g is a waveguide impedance for said ridge waveguide; and Z_{coax} is a transmission line impedance for said coaxial transmission line which is generally fifty

ohms, wherein said ridge waveguide is terminated by a quarter wave choke, wherein said ridge waveguide is terminated by a quarter wave chokew and length L_2 of said transformer is $\lambda/4$ at an operating frequency for said ridge waveguide.

18. The impedance matching feed of claim 17 wherein said probe is fabricated from an electrically conductive material.

19. The impedance matching feed of claim 17 wherein the conductor of said transformer is fabricated from an electrically conductive material, and the dielectric of said transformer is fabricated from a dielectric material.

20. The impedance matching feed of claim 17 wherein said transformer is a single step quarter wave transformer.

21. The impedance matching feed of claim 17 wherein said transformer has a constant diameter along the length of said transformer.